

**CLAIMS**

Therefore, having thus described the invention, at least the following is claimed:

- 1 1. A waveguide comprising:  
2 a waveguide core, and  
3 an air-gap cladding engaging a portion of the waveguide core.
- 1 2. The waveguide of claim 1, wherein the waveguide core includes at least one  
2 coupling element.
- 1 3. The waveguide of claim 1, further comprising:  
2 at least one coupling element disposed adjacent to the waveguide core.
- 1 4. The waveguide of claim 1, further comprising:  
2 a second waveguide cladding adjacent to the waveguide core.
- 1 5. The waveguide of claim 1, further comprising:  
2 a second waveguide core.

- 1 6. A device, comprising:  
2 a waveguide having a waveguide core and an air-gap cladding  
3 engaging a portion of waveguide core.
- 1 7. The device of claim 6, wherein the waveguide is included in a microelectronic  
2 device.
- 1 8. The device of claim 6, wherein the waveguide is included in an integrated  
2 optical device.
- 1 9. The device of claim 6, wherein the waveguide is included in a photonic crystal  
2 device.

- 1     10.     A method for fabricating a waveguide comprising:
- 2                    (a) providing a substrate having a lower cladding layer disposed on the
- 3     substrate;
- 4                    (b) disposing a waveguide core on a portion of the lower cladding
- 5     layer;
- 6                    (c) disposing a sacrificial layer onto at least one portion of the lower
- 7     cladding layer and the waveguide core;
- 8                    (d) disposing an overcoat layer onto the lower cladding layer and the
- 9     sacrificial layer; and
- 10                   (e) removing the sacrificial layer to define an air-gap cladding layer
- 11     within the overcoat polymer layer and engaging a portion of the waveguide
- 12     core.

- 1     11.     The method of claim 10, further including:
- 2                    disposing an optical grating layer adjacent to the waveguide core after
- 3                    (b) and before (c).

- 1    12.    A method for fabricating a device comprising:
- 2                    (a) providing a substrate;
- 3                    (b) disposing a waveguide core on a portion of the substrate;
- 4                    (c) disposing a sacrificial layer onto at least one portion of the substrate
- 5                    and the waveguide core;
- 6                    (d) disposing an overcoat layer onto the substrate and the sacrificial
- 7                    layer; and
- 8                    (e) removing the sacrificial layer to define an air-gap cladding layer
- 9                    within the overcoat polymer layer and engaging a portion of the waveguide
- 10                    core.

- 1 13. A system for fabricating a waveguide comprising:
- 2 (a) means for providing a substrate having a lower cladding layer
- 3 disposed on the substrate;
- 4 (b) means for disposing a waveguide core on a portion of the lower
- 5 cladding layer;
- 6 (c) means for disposing a sacrificial layer onto at least one portion of
- 7 the lower cladding layer and the waveguide core;
- 8 (d) means for disposing an overcoat layer onto the lower cladding layer
- 9 and the sacrificial layer; and
- 10 (e) means for removing the sacrificial layer to define an air-gap
- 11 cladding layer within the overcoat polymer layer and engaging a portion of the
- 12 waveguide core.